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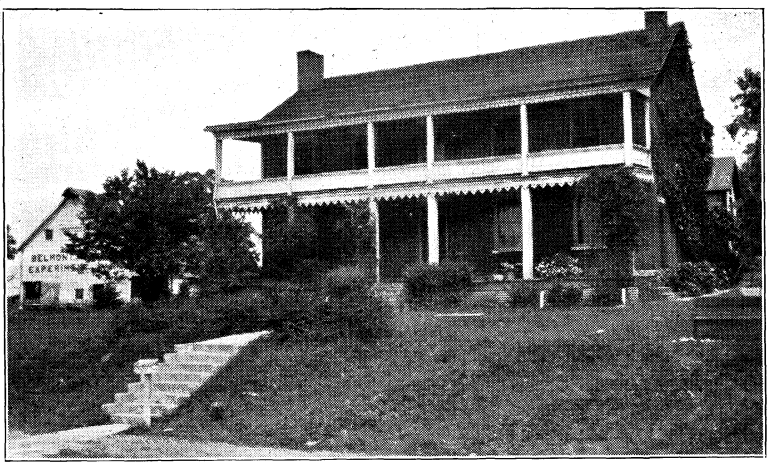

Residence on the Belmont County Experiment Farm

The Ohio Agricultural Experiment Station

September, 1926

FOREWORD

County Experiment Farms are under the supervision of the Ohio Agricultural Experiment Station. The work on them is correlated with the work at Wooster. The resulting contributions to Ohio's Agricultural Information which appear in this issue of Facts for Farmers are written by specialists in the various Departments and have especial reference to Belmont County and other counties of similar soil type.

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CONTENTS

INCREASING CROP YIELDS THRU SOIL IMPROVEMENT

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SOIL IMPROVEMENT

ROBT. M. SALTER, DEPARTMENT OF AGRONOMY

The fertility experiment, begun in 1917, was designed to determine the effects of fertilizers, manure, and lime upon a 4-year rotation of corn, wheat, clover, and timothy. The rotation was selected as being typical of that practiced on the average farm of Belmont County, crop statistics showing that for each acre of corn grown there are produced on the average one acre of small grain and two acres of hay. Since in this rotation the land is plowed but once in four years, the danger of soil erosion, an ever present menace on these hilly lands, is reduced to a minimum. Beginning in 1925, oats have been substituted for wheat in the rotation, the object being to better meet the feed requirements of dairy farming, which is rapidly assuming a leading position in the agriculture of the county.

TABLE 1.—Plan of Fertility Experiment
Rotation: Corn, Wheat, Clover, Timothy

Plot No.	Materials applied*	Application on			Total for rotation	Cost for rotation
		Corn	Wheat	Timothy		
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Dol.*
1	None					
2	0—16—0	200	200	200	600	6.54
3	0—16—4	200	200	200	600	9.68
4	None					
5	4—16—4 0—16—4	200	200	200	400 200	12.12
6	4—16—4 0—16—4 Limestone	200 2 T.	200	200	400 200 2 T.	22.12
7	None					
8	Manure	5 T.		5 T.	10 T.	10.00
9	Manure 0—16—0	5 T. 200		5 T. 200	10 T. 400	16.54
10	None					

*Fertilizers applied in the form of the pure materials, 16 percent acid phosphate, muriate of potash, and nitrate of soda.

The soil under experiment is the Dekalb silt loam, which has originated from the weathering in place of non-limestone sandstones and shales. This soil type is general over the county but predominates in the western half. It is a friable, shallow soil, yellowish gray in color, possessing fair to good natural drainage but too acid to grow good red clover without liming. It is more

deficient in lime than the soils of the Westmoreland and Belmont series which are largely in the eastern half of the county and have been derived from parent rock containing considerable limestone.

The fertilizers are applied to both grain crops and also to the timothy, the object of treating the meadow being to secure data which may be applied on farms where the land is permitted to remain in hay for several years with the too common result that the hay crop deteriorates in both yield and quality and when finally plowed down adds very little to the organic matter supply of the soil. The fertilizers applied have been in the form of the pure materials, acid phosphate, muriate of potash, and nitrate of soda. However, since most farmers of the county, when buying more than one element of fertility, purchase commercial mixed goods, it appears best in reporting the experiment to translate the treatments into terms of commercial mixed fertilizer analyses and to figure the costs on this basis.

The treatments given the individual crops, together with the cost per acre for the rotation on each plot, are shown in Table 1. The average yields and the increases due to treatment are given for corn and wheat in Tables 2 and 3 and for timothy and clover in Tables 4 and 5. In Table 6 are shown the total value of the increased crops for the rotation on each plot, the cost of the treatment, and the balance obtained by subtracting the cost from the value of the increase. In figuring the value of the crop increases the following prices were used: corn with its stover, 70 cents per bushel; wheat with its straw, $1.25 per bushel; clover and timothy hay, each $15 per ton. Ground limestone is figured at $5 per ton delivered, and fertilizers in all cases at the 1926 spring cash prices delivered in the county.

Liming highly profitable.—The most outstanding lesson taught by the fertility experiment is that this soil must be limed to grow the highest yields, not only of clover but of the grain crops and timothy as well. Plots 5 and 6 receive the same fertilizer treatment, but Plot 5 is unlimed while Plot 6 receives an application of 2 tons of ground limestone per rotation, applied to the corn crop. The difference in the yields of these two plots has averaged 12.23 bushels of corn, 3.97 bushels of wheat, 1697 pounds of clover hay, and 938 pounds of timothy hay, with a total value of $33.29 for the rotation. Two tons of ground limestone should not cost more than $10 applied to the land. The increase in the clover alone has had a value of $12.74, or more than enough to cover the cost of liming. In addition to its effect on the yield, the limestone has produced a

marked improvement in the quality of the first year hay crop. On all unlimed plots, even on Plot 9 receiving manure and acid phosphate, the first year hay crop has contained a large proportion of timothy, other grasses, and weeds. On the limed plot clover comprises the bulk of the vegetation. It seems probable that a part of the increase in timothy and the grain crops due to liming may have resulted indirectly from the fertilizing value of the roots and stubble left by the clover.

Only one plot in the series has received limestone in addition to the fertilizer treatment. It is fair to assume, however, that liming would have proved highly profitable with any of the treatments given. It is also probable that the 0-16-4 applied on Plot 3 would have made a much better showing on limed soil since other experiments indicate that lime is essential to realizing the full value of potash additions on acid soils. On a limed soil of not far different character at Wooster, an 0-12-4 has proved decidedly superior to acid phosphate as a fertilizer for corn on unmanured land.

The adoption of a regular liming program upon all soils in Belmont County which do not produce consistently good crops of red clover should add materially to the profit in their handling. An application of 2 tons of fine ground limestone, 1¼ tons of hydrated lime, or 3 tons of limestone meal every four to six years should keep the soil in condition to grow good crops of red clover, sweet clover, or alfalfa. Experiments at Wooster indicate that lime may be applied at any convenient time during the rotation with about equal results. Applications to sod land in the fall or winter offer the advantage that labor is usually more plentiful at these seasons of the year. Where one has neglected to lime before seeding, top-dressings on new seedings of clover or alfalfa may be made with the assurance that the stand will be benefitted.

Phosphate and manure for corn.—The livestock kept on the average Belmont County farm should produce approximately 12.5 tons of manure for each 4 acres in crops. If it were possible to recover three-fourths of the manure produced, the quantity should be sufficient for one application of 9 or 10 tons per acre in a 4-year rotation. In the fertility experiment 10 tons of well-cared-for manure, split equally between the timothy and the next year's corn crop, produced an average yield for the 9-year period of nearly 63 bushels of corn, 14.5 bushels more than unmanured land. Figuring the value of the increase for all crops in the rotation shows a return of $28.30, or $2.83 for each ton of manure applied.

Manure alone is not an ideally balanced fertilizer, being relatively deficient in phosphoric acid compared to ammonia and potash. Supplementing each 5-ton application of manure with a broadcast dressing of 200 pounds of 16 percent acid phosphate has given an additional increase of 3.55 bushels of corn, 4.40 bushels of wheat, 483 pounds of clover, and 145 pounds of timothy hay, with a total value of $12.60 compared to a cash outlay of $4.36 for the acid phosphate.

TABLE 2.—Fertilizers, Manure, and Limestone on CORN in Rotation With Clover and Timothy. Yield and Increase per Acre, 9-year Average

Plot No.	Treatment per acre	Yield		Increase	
		Grain	Stover	Grain	Stover
		Bu.	*Lb.*	*Bu.*	*Lb.*
1	None	52.26	2,746	.....	.....
2	0-16-0, 200 lb.	59.76	2,984	7.29	254
3	0-16-4, 200 lb.	56.24	2,847	3.56	135
4	None	52.89	2,695	.....	.....
5	4-16-4, 200 lb.	58.34	3,003	6.49	331
6	4-16-4, 200 lb. Ground limestone, 2 T.	69.54	3,002	18.72	465
7	None	49.79	2,624	.....	.....
8	Manure, 5 T.	62.82	3,273	14.49	696
9	Manure, 5 T. 0-16-0, 200 lb.	64.92	3,421	18.04	892
10	None	45.42	2,481	.....	.....
	Average unfertilized yield	50.09	2,637	.....	.....
	Average fertilized yield	62.49	3,107	.....	.....

The yield of corn with acid phosphate and manure has averaged just a little less than 65 bushels per acre. This plot was not limed. Had limestone been used and with as good results as on Plot 6 the yield of corn would have averaged more than 75 bushels per acre. Limestone, manure, and acid phosphate make nearly an ideal combination for the corn crop. Experience indicates, however, that in backward seasons it may be profitable to supplement this general treatment with a little high grade complete fertilizer in the hill or row. One hundred pounds per acre of a 3-12-4 analysis is suggested. In purchasing acid phosphate the farmer has an opportunity to economize both in cost per unit of plant food and in labor of handling by confining his purchase to the higher analysis phosphates. The 20 and 24 percent grades of acid phosphate are now available and can be substituted for the 16 percent grade with assurance of equal results per pound of phosphoric acid applied.

Fertilizing the wheat crop.—On unmanured soils of moderate fertility wheat commonly gives the most profitable response to a complete fertilizer containing a relatively high proportion of phosphoric acid compared to the ammonia and potash. The 200 pounds

of 4-16-4 applied to wheat on Plot 5 has given a good return even tho no lime is applied to this plot. The increases of 6.28 bushels of wheat, and of 780 pounds in the following hay crop which gets no additional fertilizer, have a combined value of $13.70 compared to a cost of $4.56 for 200 pounds of 4-16-4 fertilizer. While a part of the increase for both crops may be attributed to the residual effect of the fertilizer treatments given to corn and timothy, there is little doubt that the application given the wheat has been highly profitable. Two hundred pounds of 4-16-4 carries the same amounts of the fertilizing elements as 400 pounds of 2-8-2. In eleven years of experiment at Wooster 1000 pounds of 2-8-2 applied to corn and wheat in a 4-year rotation of corn, oats, wheat, and clover has given crop increases having a value of $7.99 less than those produced by an equal amount of 2-12-2, the increased cost of the additional 4 percent of phosphoric acid being only $1.50. In the Belmont County experiment it is possible that a fertilizer of the 2-12-2, 3-18-3, or 4-24-4 variety would likewise have proved more profitable than the 4-16-4 analysis. In the Wooster experiments it has also been found profitable to increase the application made to wheat at the expense of the treatment given the corn, oats, and hay where the total fertilizer applied during the rotation remains the same. In a rotation of corn, wheat, clover, timothy receiving 600 pounds of fertilizer, the treatment given in the Belmont County experiment, a better distribution of the fertilizer would probably have been 400 pounds on wheat and 200 pounds on corn leaving the hay crops unfertilized except possibly for a top-dressing of nitrate of soda or sulphate of ammonia on the timothy crop.

TABLE 3.—Fertilizers, Manure, and Limestone on WHEAT in Rotation With Clover and Timothy. Yield and Increase per Acre, 7-year Average

Plot No.	Treatment per acre	Yield		Increase	
		Grain	Straw	Grain	Straw
		Bu.	*Lb.*	*Bu.*	*Lb.*
1	None	9.42	1,131		
2	0—16—0, 200 lb.	12.93	1,345	3.34	209
3	0—16—4, 200 lb.	14.84	1,481	5.09	339
4	None	9.96	1,147		
5	4—16—4, 200 lb.	15.81	1,610	6.28	476
6	4—16—4, 200 lb. + Limestone on corn	19.39	1,914	10.25	795
7	None	8.76	1,106		
8	Manure on corn and timothy	13.13	1,391	4.82	365
9	Manure and acid phosphate on corn and timothy	17.10	2,149	9.22	775
10	None	7.44	864		
	Average unfertilized yield	8.89	1,062		
	Average fertilized yield	15.54	1,577		

Where wheat follows manured corn the fertilizer applied to the wheat may properly be straight acid phosphate, except on very thin land where a 2-12-2 or 2-16-2 analysis may be a better choice. On Plot 8 of the Belmont County experiment the residue left from 10 tons of manure applied to the preceding crops of timothy and corn increased the yield of wheat 4.82 bushels. Where both manure and acid phosphate were applied to the corn and timothy on Plot 9, the wheat was increased 9.22 bushels, altho it received no direct treatment. Had a generous application of acid phosphate been given the wheat on this plot, there is little doubt that the yield would have been increased above the best plot of the series—namely, Plot 6, receiving complete fertilizer and limestone. There is also reason to believe that if part of the manure given Plot 9 had been applied as a light winter top-dressing to the wheat, the yield of wheat would have been further increased and the stand of clover following materially improved.

Fertilizing timothy meadows.—There are probably many fields in Belmont County, which, because of the danger of erosion under cultivation, should be kept more or less permanently in meadow. To do so profitably, however, requires that the timothy crop be regularly manured or fertilized to maintain the yields and prevent deterioration in the quality of the hay produced. Timothy being a non-legume, and hence unable to utilize atmospheric nitrogen, the addition of this element in the form of manure or fertilizer to timothy meadow land is essential to the maintenance of good yields. Unfortunately no nitrogen has been applied in the fertilizer treatment given any of the plots in the Belmont County experiment.

TABLE 4.—Effect of Fertilizing TIMOTHY in 4-year Rotation of Corn, Wheat, Clover, and Timothy. Yield and Increase per Acre, 6-year Average

Plot No.	Treatment per acre	Yield	Increase
		Lb.	*Lb.*
1	None	2,239	
2	0-16-0, 200 lb	2,303	264
3	0-16-4, 200 lb	2,239	276
4	None	2,140	
5	0-16-4, 200 lb.*	2,620	643
6	0-16-4, 200 lb.; limestone on corn*	3,565	1,581
7	None	2,317	
8	Manure, 5 T.	3,117	855
9	Manure, 5 T.; 0-16-0, 200 lb.	3,191	1,000
10	None	2,143	
	Average unfertilized yield	2,208	
	Average fertilized yield	2,985	

*A 4-16-4 fertilizer applied to corn and wheat.

TABLE 5.—Residual Effect on CLOVER of Treatment on Previous Crops, in 4-year Rotation of Corn, Wheat, Clover, and Timothy. Yield and Increase per Acre, 6-year Average

Plot No.	Treatment per acre	Yield	Increase
		Lb.	*Lb.*
1	None	1,966	
2	0-16-0, 400 lb.	2,405	400
3	0-16-4, 400 lb	2,600	555
4	None	2,085	
5	4-16-4, 400 lb.	2,791	780
6	4-16-4, 400 lb.; ground limestone, 2 T.	4,413	2,477
7	None	1,863	
8	Manure, 5 T.	2,524	749
9	Manure, 5 T.; 0-16-0, 400 lb.	2,952	1,232
10	None	1,649	
	Average unfertilized yield	1,890	
	Average fertilized yield	2,950	

On the basis of experiments made at other points in Ohio, including trials of nitrate of soda on timothy at the Timothy Breeding Station in Erie County, the suggestion is made that an annual early spring top-dressing of 200 pounds per acre of a fertilizer made by mixing equal parts of nitrate of soda and an 0-14-4 or 0-12-6 mixed fertilizer could be profitably applied. Sulfate of ammonia may be substituted for the nitrate of soda in such a mixture, using 3 pounds of the sulfate in place of 4 pounds of the nitrate.

TABLE 6.—Value of Crop Increases Produced by Fertilizers, Manure, and Limestone, With Cost of Treatments, and Balance

Plot No.	Treatment per rotation	Value of crop increases	Cost of treatment	Balance
2	0—16—0, 600 lb.	$14.26	$ 6.54	$ 7.72
3	4—16—4, 600 lb.	15.08	9.68	5.40
5	4—16—4, 400 lb. + 0—16—0, 200 lb.	23.06	12.36	10.70
6	4—16—4, 400 lb. + 0—16—4, 200 lb. + Ground limestone, 2 T.	56.35	22.36	33.99
8	Manure, 10 T.	28.30	10.00*	18.30
9	Manure, 10 T. + 0—16—0, 400 lb.	40.90	16.54*	24.36

*A charge of $1 per ton is made against the manure to cover cost of spreading.

Improved rotations for the dairy farm.—Timothy hay is not an ideal feed for dairy animals. It is possible to improve the common corn-small grain-clover-timothy rotation by including alfalfa in the seeding and reducing the amount of timothy sown. To grow alfalfa successfully, however, requires more lime in the soil than for red clover and timothy. Where the lime needs are supplied, a seeding of red clover and alfalfa, each 4 pounds per acre, with 2 pounds of alsike clover and 3 pounds of timothy may be expected to

increase the tonnage of both first and second year hay crops and give a good proportion of alfalfa in the second-year crop. The alfalfa seed will need to be inoculated unless the land has previously grown the crop. For soils of high fertility, well supplied with lime, the hay crop may be further improved by seeding straight alfalfa in place of a mixture. At Wooster, on limed land receiving uniform treatment with manure and fertilizers, a rotation of corn, oats, alfalfa, alfalfa, alfalfa has given one-fourth more hay than a rotation of corn, wheat, clover, timothy, timothy as an 11-year average, and the feeding value of the hay produced has been greatly superior.

VARIETY AND CULTURAL EXPERIMENTS

J. S. CUTLER, DEPARTMENT OF AGRONOMY

The field-crops experimental work on this farm has consisted largely of variety testing. A number of varieties of wheat, corn, oats, and soybeans have been tested since 1918 with some interesting results on varietal adaptation as measured by the comparative yields.

WHEAT VARIETIES

Gladden wheat has given the highest average yield in a six-year test, 30.52 bushels per acre; Ohio 9920 second, 28.23; and Fulhio third, 27.78 bushels. However, it should be borne in mind that no one variety is adapted to all the soil and growing conditions in a county. Any one of the high-yielding varieties is likely to give good results.

TABLE 7.—Wheat Variety Test 1918-24, 6-year Average* per Acre

Variety	Yield	Straw	Straw per bushel grain
	Bu.	*Lb.*	*Lb.*
Gladden	30.52	3,829	125
Ohio 9920	28.23	3,331	118
Fulhio	27.78	3,427	123
Velvet Chaff	27.49	3,276	119
Trumbull	25.19	2,680	106

*No yields secured in 1923 and 1925.

OATS VARIETIES

Big Four oats has a substantial lead over all the other varieties in the test with an average yield of 60.57 bushels per acre. Miami is second and Ohio 6222 third with yields of 53.76 and 52.03 bushels, respectively. Comparing Miami and Big Four over the same seven-year period, Big Four leads by 3.07 bushels. Fulghum has been tested over a three-year period from 1923 to 1925, averaging 50.04 bushels, while Big Four and Miami averaged 61.14 and 57.65 bushels, respectively, for the same years.

TABLE 8.—Oats Variety Test 1917-1925, Average Yield per Acre

Variety	Years tested	Grain	Straw	Straw per bushel grain
	No.	*Bu.*	*Lb.*	*Lb*
Big Four	7	60.57	2,135	38
Miami	9	53.76	2,863*	53
Ohio 6222	9	52.03	2,473	48
Silvermine	5	50.86	2,480	49
Wideawake	6	48.29	2,308	48
Ohio 7009	6	42.33	1,276	30

*7-year average for Miami oats straw, yields for 1921 and 1922 not included.

CORN VARIETIES

Cook 75, an early strain of Reid's Yellow Dent, from Hardin County, has lead by four bushels per acre over Leaming, its nearest competitor. Of the varieties tested, Darke County Mammoth is the latest in maturity and White Cap the earliest. The other varieties in the test all mature in the normal or average growing season. These varieties have given consistently good yields. White Cap, while an early variety, is a mixed corn and so is not desirable from a community standpoint. Corn readily cross pollinates and the growing of mixed corns by a few farmers results in a color hodgepodge in the corn of a community. Feeding tests to date indicate that yellow corn is the best for dry lot feeding.

TABLE 9.—Varieties of Corn for Grain, 8-year Average Yield per Acre, 1917-24

Variety	Ear corn	Shelled corn	Shrinkage	Stover
	Bu.	*Bu.*	*Pct.*	*Lb.*
Cook 75	77.50	64.12	17.26	4,275
Leaming	71.57	60.47	15.51	3,699
Ohio 84	70.40	60.45	14.14	3,730
White Cap	64.25	58.31	9.24	3,803
Clarage	67.93	57.92	14.74	3,507
Darke County Mammoth	73.09	56.61	22.54	4,155

SOYBEANS FOR HAY

The soybean hay tests indicate that soybeans may be expected to yield from 1½ to 2¼ tons per acre. Soybean hay is palatable and corresponds closely in digestible nutrients to alfalfa and sweet clover. Chemical analyses in Henry and Morrison's book on "Feeds and Feeding" show that soybean hay contains on the average 11.7 percent of digestible protein; alfalfa, 10.6 percent; and red clover, 7.6 percent.

Ebony has given the highest hay yield of the varieties tested. The hay made from this variety is fine stemmed and of excellent quality, as indicated by field observations. The low yield of Peking was due to thin stand. In other tests this variety ranked considerably higher in yield.

TABLE 10.—Soybeans for Hay, 2- or 3-year Average Yields per Acre, 1922-24

Variety	Years tested	Hay	
	No.	*Lb.*	*Tons*
Ebony	2	4,047	2.02
Ito San	2	3,776	1.89
Manchu	3	3,423	1.71
Medium Green	3	3,137	1.57
Hamilton	3	2,873	1.44
Manchuria	3	2,771	1.39
Virginia	3	2,724	1.36
Wilson	3	2,638	1.32
Peking	3	2,503*	1.25

*Thin stand, poor seeding in 1924.

WHEN SHOULD SOYBEANS BE CUT FOR HAY?

Soybeans may be cut for hay over a period of two to four weeks, or at any time between the full-bloom stage and when the leaves begin to turn yellow. Willard, in tests at Ohio State University, found that several factors have an important bearing on the time of cutting. Yield, ease of curing, and quality of hay are the principle ones. The yield of hay steadily increases from the full-bloom state until the leaves are one-fourth yellow. This increase in weight takes place largely in the pods and seeds. The earlier that soybeans are cut for hay the easier they are to cure. The difficulty of curing at the later stages lies in the fact that the green beans in the pods dry slowly. The later that soybeans are cut, the poorer the quality of the hay. The leaves and stems become less palatable and more woody after full bloom. There is more wastage, due to an increase in the stemminess of the hay, and also to the greater loss of leaves and seeds thru shattering. It is

better to cut early than too late. Late cutting usually means that the curing must be done in wet weather and in addition, where wheat follows soybeans in the rotation, the crop is not removed early enough to permit seeding the wheat at the proper time. The practical time to cut them is after the pods are full size and before the beans in the largest pods are half grown.

THE ORCHARD PROJECTS

I. P. LEWIS, DEPARTMENT OF HORTICULTURE

There are approximately 20 acres of orchard on the Belmont County Experiment Farm and, while the greater part of the trees have not yet come into heavy production, each year adds new points of interest.

The peach orchard contains some 340 trees of 34 different varieties. It is eight years old and is just coming into its prime. These trees had paying crops of fruit in 1923 and 1924. The heavier yielding varieties with the average yield per tree are as follows:

TABLE 11.—Varieties of Peaches, Average Yield in Pounds per Tree

Variety	1923	1924
Alton	71	134
Champion	44	120
Illinois	82	150
Belle of Georgia	76	115
Ray	72	60
Waddell	54	80
Carmen	72	60
Eureka	64	70
Krummel	54	90

The severe winter killed all the fruit buds for 1925 and caused more or less winter injury to a number of trees. Taking advantage of this loss of crop, we pruned back the orchard a little more heavily than usual in order to lower some of the higher tops and stimulate vigorous bearing wood for the next season. Severe cutting, or "dehorning" as it is sometimes called, was not practiced, as this is considered injurious and unprofitable. The pruning was limited to a moderate thinning and a cutting back of the more vigorous limbs into second- and sometimes third-year wood, always heading back to outward growing lateral shoots. An occasional lengthy branch was cut back to give a more uniform shape to the top, and all dead

and interfering branches were removed. This moderate pruning has produced an abundance of well distributed, vigorous wood growth and the trees give promise of a good crop of fruit. Trees showing winter injury were very lightly pruned as they need all their leaf surface to help them recover.

As there were some indications of the work of the peach tree borer, the orchard was treated with paradichlorobenzine, or paracide as it is sometimes called. This material, when exposed to moisture and air, gives off a gas which is heavier than air and penetrates into the runs of the borers and kills them. The ground was leveled off around the trunk of the tree and about an ounce of the material sprinkled on the ground in a circle about an inch wide and an inch from the tree trunk. The paracide was then covered with several shovelfuls of earth, mounded up and patted down so as to confine the gas to the region of the base of the tree. This was the second application of paradichlorobenzine for borers since planting the orchard, and it has kept the borers in check.

This peach orchard is in sod under the grass-mulch method of management. The trees are given a liberal application of nitrate of soda just after growth starts in the spring. In 1925 each tree received two pounds. Since the fruit was killed in 1925, no sprays were necessary except the usual dormant application of 1-8 lime-sulfur solution for control of scale and leaf curl.

Some 65 varieties of apples are being tested in an orchard of 132 trees, planted in 1917. Since then some new varieties of promise have been added and worthless varieties top-grafted to better sorts. A record is kept of the yield of each tree and any points of interest are noted. Varieties that have come into bearing early are Early Melon, Wilson Red June, Jonathan, Grimes, Esopus, Opalescent, Arkansas, Staymen, and King David. The more recent plantings are Ensee, Gallia Beauty, Golden Delicious, Cortland, Tioga, Macowan, Delicious 1949, Orleans, and Medina. It is also planned to add trees of the Melba, and to test some of the new red strains of known varieties, such as the red Delicious called Starking, Red Spy, Red Dutchess, and Red Gravenstein.

This orchard is under the grass mulch method of management. The grass is mowed twice each season and used as a mulch around the trees. The trees are given an application of nitrate of soda each year; in 1925, each tree received 2 pounds early in the spring soon after growth had started.

A block of 248 apple trees, called the Cultural Orchard, is being used for soil management and fertility experiments. This orchard was planted in 1917, the ground being plowed and trees all set alike. It contains eight rows of trees—four of Jonathan and four of Rome Beauty. The west half, containing two rows of each, was sown to a mixture of legumes and the east half, also containing two rows of each variety, was sown to a mixture of grasses. The object is to maintain the west half of the orchard in a leguminous sod and the east half in a grass sod for comparison. It has cost more to maintain the legume section but the trees show a slightly larger tree growth than those in the grass section. The trees in grass mulch thus far have produced a little more fruit than those in the legume plots. The total yields under the two methods of culture for the last three years are as follows:

Year	Legume mulch Lb.	Grass mulch Lb.
1923	413	492
1924	532	806
1925	2,717	3,109
Total	3,662	4,407
Average per tree	76	91

No nitrogen fertilizer was applied to this cultural orchard until the spring of 1925, when a new fertilization experiment was started. The orchard was divided across the legume and grass sections into eight plots. Two of these plots were fertilized with 1½ pounds of nitrate of soda per tree in early spring, two received the same amount half applied early in the spring and half about the first of June; two received the 1½ pounds of nitrate in the fall after the foliage had been killed by frost but before freezing weather, and the remaining two plots received no fertilizer at all. The amount of nitrate of soda applied to each tree is to be increased one-fourth pound each year. The fertilizer is applied in a circle under the outer ends of the branches. The object of this experiment is to determine the best time or times to apply the nitrate to apple trees. This being the first year of the experiment, and since fertilizer applied one season is expected to make growth for the next season's crop, yields in 1925 will not measure the effect of the treatments.

A good spraying program is necessary for the production of good fruit. Five sprays were applied on the apple orchard in 1925, as follows: (1) dormant application, lime-sulfur solution 1 gallon to 8 of water; (2) pink of blossom buds, dry lime-sulfur 4 pounds to

50 gallons of water; (3) after petals fall, 3 pounds of dry lime-sulfur and 1 pound arsenate of lead powder to 50 gallons of water; (4) two weeks after petals fall, the same mixture as the third spray; (5) mid-July spray, the same mixture as third and fourth sprays. Timeliness and thoroness of the applications are of great importance.

The roadside market with its demand for a variety of fruit has become so important, especially along the National Road in the County, that it was thought proper to test some of the better varieties of stone fruits and grapes for local conditions. An orchard of cherry and plum varieties for this purpose was started in 1922. There are at present seven varieties of cherries and six of plums, 80 trees in all in the orchard. The cherries include Early Richmond, Late Duke, Montmorency, English Morella, Hortense, Baldwin, and Ostheimer. The plums are Yellow Egg, Grand Duke, Bavay, Monarch, German Prune, and Bradshaw. Some promising new varieties, such as Tradgedy plum and Coates Improved Prune, are to be added.

The grape vineyard was planted in 1923, and includes eight varieties of 10 vines each. These are Eclipse, Niagara, Delaware, Winshell, Concord, Brighton, Worden, and Caco. The vines are 8 feet apart in the row with the rows 10 feet apart. The vineyard has been under cultivation since setting. Each vine is fertilized each season with a small amount of nitrate of soda and the vineyard as a whole is given a top-dressing of manure. The vines are trained and pruned to the two wire Kniffen system.

TABLE 12.—Number of Plots and Highest and Lowest Yields

Crop	Number of plots	Highest yield per acre	Lowest yield per acre
Plot work 1924			
Corn	22	80.3 bu.	27.2 bu.
Hay	20	3.8 T.	.9 T.
Oats	9	65.1 bu.	48.6 bu.
Wheat	20	26.0 bu.	1.2 bu.
Potatoes	3	125.7 bu.	101.0 bu.
Corn silage	12	9.0 T.	4.6 T.
Barley	1	20.9 bu.	20.9 bu.
Soybean hay	12	5.0 T.	1.3 T.
Plot work 1925			
Corn	20	75.0 bu.	30.0 bu.
Clover	20	2.6 T.	.8 T.
Soybean (hay)	10	3.1 T.	2.3 T.
Oats	22	76.4 bu.	37.8 bu.
Potatoes	6	82.0 bu.	28.0 bu.
Pastures	20	.....	.....

These variations in crop yields are due to differences in fertility treatment or variety characteristics.